Reply on "Aging Effects in a Lennard-Jones Glass"

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In their comment to our Letter on aging in a Lennard-Jones glass [1], Müssel and Rieger [2] give evidence that a different type of scaling function, specified below, might give rise to a better scaling of the two-time correlation functions $C_q(t_w, t_w+t)$ than the scaling function propsed by us. By using data stemming from their own simulation, they show that a scaling of the form

$$C_q(t_w, t_w+t) \sim \tilde{C}\{\ln((t+t_w)/\tau)/\ln(t_w/\tau)\}, \qquad (1)$$

where τ is a fit parameter, leads to a better collapse of the curves for the different waiting times t_w, than the scaling used by us, which is of the form $C_q(t_w, t_w+t) \sim \tilde{C}\{t/t_r\}$, with $t_r \propto t_w^\alpha$, $\alpha \approx 0.9$, and which thus almost corresponds to "simple aging" ($t_r \propto t_w$). We therefore used the scaling function proposed by Müssel and Rieger in order to see whether this function can be used to scale also the data from *our* simulation onto a master function and show the result in Fig 1. The value of τ is 0.005, which is comparable to the one found by Müssel and Rieger for their data. As is evident from the figure, this sort of scaling (main figure) does not work well for our data and is clearly inferior than the scaling proposed by us (inset). Thus we conclude that the scaling function proposed by Müssel and Rieger is not always appropriate to scale the two-time correlation functions for this sort of system.

What remains unclear for the moment is the reason why the scaling function given by Eq. (1) works for the data of Müssel and Rieger, whereas it fails to do so for our data. A careful comparison of their and our data shows that the two sets of curves show some systematic differences, in that, e.g, the height of the plateau at intermediate times is slightly larger in their data than in our data. Also, as stated by Müssel and Rieger, the t_w dependence of the relaxation time t_r differs from ours, since they find that the exponent α is 1.1 (as oposed to 0.88). The reason for the difference of the relaxation data might be that the two simulations were not carried out in exactly the same way. For example the size of the system is different (32768 vs. 1000), the time step is different (0.01 vs. 0.02) and the value of the wave-vector is different (7.5 vs. 7.25). It is not clear which ones of these differences, if any, gives rise to the slightly different aging behavior. It has been found before, however, that the details of the nonequilibrium dyamics can depend quite sensitively on the details of the simulations [1,3]. Finally we mention that if T_f, the final temperature of the quench, is decreased significantly, the scaling behavior found in Ref. [1] does not seem to hold anymore and that also the Ansatz given by Eq. (1) does not seem to work [4]

[1] W. Kob and J.-L. Barrat, Phys. Rev. Lett. **78**, 4581 (1997).
[2] U. Müssel and H. Rieger, Phys. Rev. Lett. **xx**, xxxx (199x).
[3] G. Parisi, Report No. cond-mat/9701015.
[4] J.-L. Barrat and W. Kob (unpublished).

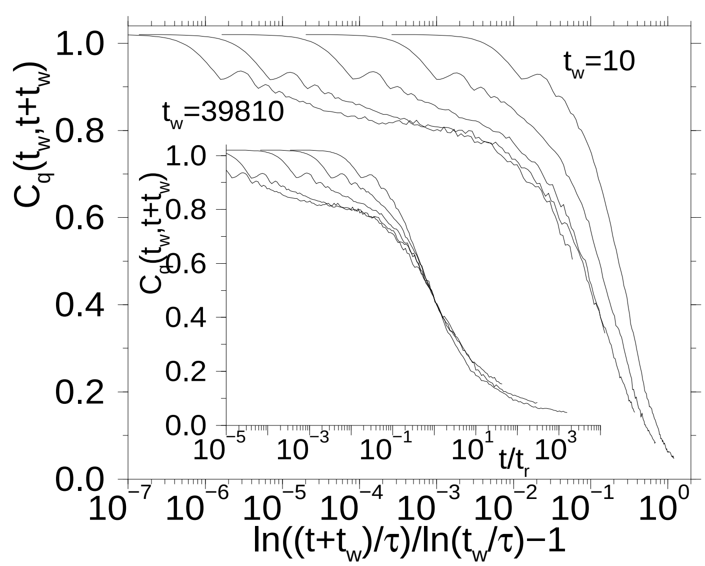

FIG. 1. Main figure: The data of Ref. [1] scaled in the way proposed by Müssel and Rieger with $\tau = 0.005$. Note that the data for $t_w = 0$ is not shown. Inset: The same data but scaled by $t_r \propto t_w^{0.88}$.